

June 20, 1961

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2,989,656

BRUSH HOLDER

Filed Nov. 12, 1958

Fig. 1

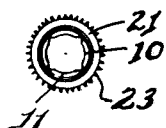


Fig. 2

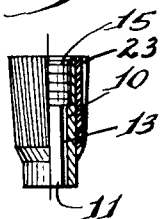


Fig. 3

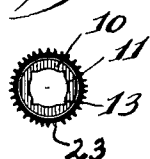


Fig. 5

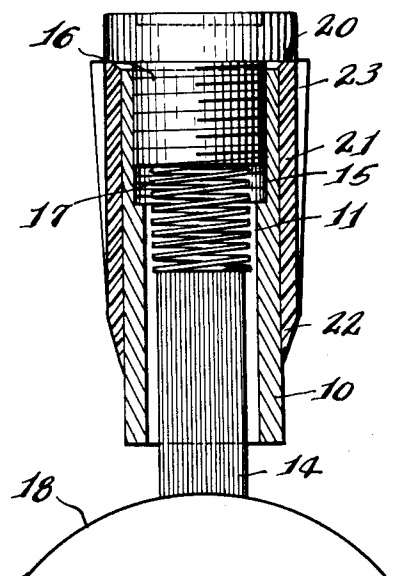
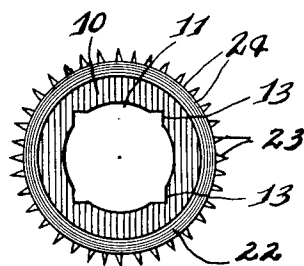


Fig. 4

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2,989,656

BRUSH HOLDER

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Filed Nov. 12, 1958, Ser. No. 773,380
6 Claims. (Cl. 310-247)

This invention relates to holders for carbon composition commutator brushes of rotary electric machines such as electric motors of portable powered hand tools.

It is a general object of the invention to provide a new and improved brush holder of the type described.

A more specific object is to provide a new and improved brush holder of improved construction insuring retention of the holder in the housings of electric motors or the like.

In the past, brush holders of the character mentioned have been made of a variety of materials and according to a variety of patterns. For example, a preferred construction for electric motors of powered hand tools has utilized a tubular brass body forced into an outer sleeve of vulcanized fibre which is in turn fitted in a preformed recess in the motor housing. This construction has been attended by serious problems in that varying conditions of relative humidity and the heat developed during operation of the motor cause expansion and contraction of the fibres to the extent that they loosen severely in service, causing deterioration of the holder. In dry climates particularly, the vulcanized fibre sleeve shrinks and the holder becomes loose in the motor housing and may fall out. Successful use of such holders requires molding of the sleeve in the motor housing with sufficient force to insure permanent retention, an expensive process.

The present invention provides a holder of improved materials including a molded outer sleeve of a thermosetting plastic unaffected by changes in humidity and resistant to the heat of motor operation, such sleeve being formed on its outer surface with longitudinal ridges or knurls of tapering height which enable a secure fitting of the sleeve in the motor housing. This construction may be manufactured economically without the necessity of close tolerances, and enables assembly with a minimum of time and expense.

Other objects and advantages will become readily apparent from the following detailed description taken in connection with the accompanying drawings, in which:

FIG. 1 is an end elevational view of a brush holder embodying the principles of the present invention, approximately to scale, indicating the size of a preferred embodiment;

FIG. 2 is a side elevational view of the holder illustrated in FIG. 1, the view being partly in section;

FIG. 3 is an end elevational view of the opposite end from that shown in FIG. 1;

FIG. 4 is an end elevational view similar to FIG. 3, at a larger scale; and

FIG. 5 is an enlarged longitudinal sectional view of the holder, also illustrating a brush in the holder, a spring urging the brush outwardly, and a retaining plug.

While an illustrative embodiment of the invention is shown in the drawings and will be described in detail herein, the invention is susceptible of embodiment in many different forms, and it should be understood that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

Referring now to the drawings in more detail, in a preferred embodiment, the brush holder of this invention includes an inner tubular body 10 of suitable metal material such as brass. The lower end of the body 10 is

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formed with a bore as at 11, and the wall of the bore is recessed longitudinally to provide squared corners as at 13 forming a recess for retaining a brush 14 of rectangular cross section against rotation in the holder. As illustrated in FIGS. 2 and 5, the opposite end of the brass body is threaded internally as at 15 to receive a threaded cap or plug 16 for retaining the brush and a coiled compression spring as at 17, the latter urging the brush outwardly toward commutator segments of an electric motor or the like illustrated generally at 18.

On the cylindrical outside surface of the tubular body 10 there is molded an outer sleeve 20 of a thermosetting plastic material. The sleeve 20 includes a major portion 21 of cylindrical configuration extending from the upper end of the body 10 toward the lower end thereof, a tapering end portion 22 extending from the lower end of the cylindrical major portion 21 and terminating short of the lower end of the tubular brass body 10. The cylindrical major portion of the molded sleeve 20 is formed with outstanding knurls or ridges 23 which are circumferentially spaced and which extend longitudinally of the sleeve from the upper end to the beginning of the tapered portion 22. The ridges 23 are of tapering height, diminishing from a maximum height at the upper end of the sleeve to nothing at the lower end of the cylindrical major portion 21.

It should be understood that while a preferred embodiment is shown approximately to scale in FIGS. 1, 2 and 3, the outer tapering ridges 23 are shown at an exaggerated scale in these figures as well as FIGS. 4 and 5, for purposes of clarity as the cross section of the ridges is rather small. For example, in a preferred embodiment the tubular brass body 10 is about 1" long, $\frac{7}{16}$ " in outer diameter, and about $\frac{1}{16}$ " thick. The outer molded sleeve 20 throughout the cylindrical major portion 21 has a thickness of $\frac{1}{16}$ ". In such an embodiment, the tiny knurls or ridges 23 are preferably spaced about .045" to .050" apart and have a height at the upper end of the holder of .003" to .005". At the lower end, the knurls or ridges taper to nothing at or above the lower end of the cylindrical major portion 21.

In use, the holder illustrated is intended for insertion into a substantially cylindrical recess in a molded plastic housing or die-cast metal (usually aluminum) housing of an electric motor or the like which includes rotating commutator segments as at 18 to be engaged by a brush such as that shown at 14, the spring 16 maintaining the brush in engagement with the commutator segments. A major problem confronting manufacturers lies in the manner of securely affixing holders of this general character in the motor housing so that they are retained against removal. One aspect of this problem involves the provision of a suitable means of retention at an economical cost. The present invention has the advantage of providing a holder which may be economically manufactured and positioned and at the same time insures permanent retention in the motor housing.

More particularly, the outer sleeve 21 comprises a phenolic bonded, mineral filled molding composition which is thermosetting. The sleeve is molded on the hollow brass body under suitable conditions of heat and pressure and, after cooling, is resistant to subsequent applications of heat as may arise during operation of the motor and is unaffected by changes in humidity. Thus, the material is resistant to the conditions which have fostered the problems heretofore encountered. The provision of the knurls or ridges 23, molded on the outer sleeve insure retention of the holder in the complementary recess of an electric motor housing. Normally, the holder will be inserted into a substantially cylindrical recess having a diameter somewhat greater than the outer diameter of the cylindrical portion 21 and somewhat less than

the maximum height of the knurls 23. The holder is easily inserted with the lower end of the tubular brass body 22, the tapered portion of the outer sleeve, and the tapering portion of the knurls guiding the holder and centering the same in the recess. As the holder is forced into the recess, the ridges or knurls 23 are deformed and displaced into the spaces 24 between the ridges, these spaces being adequate to receive so much of the material of the ridges as may be necessary to enable reduction of the ridges to suitable height to permit entry of the holder. In this fashion, substantially the entire periphery of the holder is tightly wedged into the recess of the motor housing for a substantial portion of the length. An advantage of the present construction lies in the economy afforded by the tapering outer configuration of the holder which eliminates the need for maintaining precise tolerances in manufacture.

I claim:

1. A brush holder for insertion into a cylindrical recess in a die-cast electric motor housing or the like, comprising, a tubular metal body for holding a commutator brush to project outwardly of the body at one end thereof, internal threads in the opposite end of said body for receiving a threaded brush retainer plug, an outer sleeve of thermosetting plastic material molded on said metal body, said sleeve including a cylindrical major portion extending from said opposite end toward said one end, a tapering end portion extending from said cylindrical portion toward said one end and terminating short of said one end, and outer circumferentially spaced, longitudinally extending crushable ridges on said cylindrical portion of tapering height diminishing from a maximum at said other end to nothing adjacent said tapering end portion, said ridges being deformable into the spaces between ridges when the holder is forced into a recess having a diameter greater than the diameter of the cylindrical major portion but less than the diameter of the holder at the maximum height of the ridges.

2. A brush holder for insertion into a recess of a die-cast electric motor housing or the like, comprising, a tubular metal body for holding a commutator brush to project outwardly of the body at one end thereof, internal threads in the opposite end of said body for receiving a threaded brush retainer plug, an outer sleeve of thermosetting plastic material molded on said body, said sleeve extending from said opposite end toward said one end and having a tapering end portion terminating short of said one end, and outer longitudinally extending laterally spaced crushable ridges on said sleeve of tapering height diminishing from a maximum at said opposite end to nothing adjacent said tapering end portion.

3. A brush holder for insertion into a generally cylindrical

recess of a die-cast electric motor housing or the like, comprising, a tubular metal body for holding a commutator brush, an outer sleeve of thermosetting plastic material molded on said body, including a major portion of generally cylindrical outer configuration extending from one end of said receiver toward the other end thereof, a conically tapering end portion extending from said major portion toward said other end and terminating short of said other end, and outer circumferentially spaced, longitudinally extending crushable ridges on said major portion of tapering height diminishing from a maximum at said one end to nothing adjacent said tapering end portion, said ridges being deformable into the spaces between adjacent ridges when the holder is forced into said recess.

4. A brush holder for insertion into a generally cylindrical recess of a die-cast electric motor housing or the like, comprising, a tubular metal body for holding a commutator brush, and an outer cylindrical sleeve of thermosetting plastic material molded on said body and having outer circumferentially spaced, longitudinally extending crushable ridges of tapering height diminishing from a maximum adjacent one end of the sleeve to a minimum adjacent the other end of the sleeve and deformable into the spaces between ridges when the holder is forced into said recess.

5. A brush holder for an electric motor or the like, comprising, a tubular metal body for receiving a commutator brush, and an outer sleeve of insulating plastic material on the outside of said body having a cylindrical outer configuration with outer circumferentially spaced, longitudinally extending crushable ridges of tapering height diminishing from a maximum adjacent one end of the sleeve to nothing adjacent the other end of the sleeve.

6. A brush holder for an electric motor or the like, comprising, a tubular metal body having an axial recess for a commutator brush, and an outer sleeve of insulating material on said body, said sleeve having outer deformable longitudinal ridges of tapering height diminishing from a maximum adjacent one end of the sleeve to a minimum adjacent the other end of the sleeve.

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